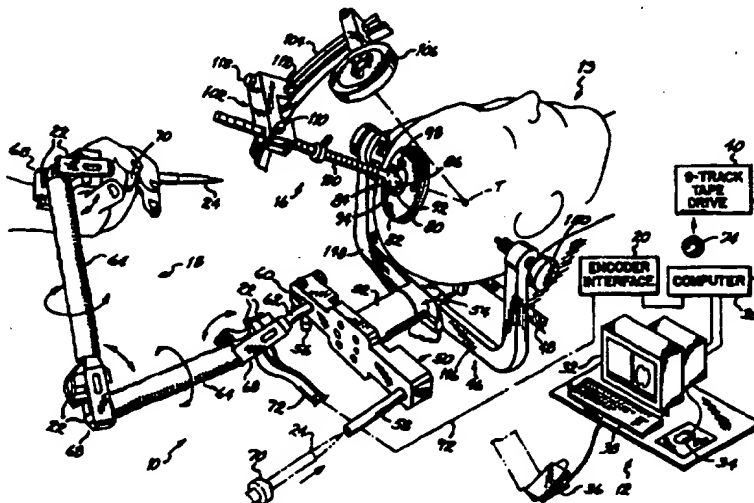




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>A61B 19/00</b>	<b>A3</b>	<b>(11) International Publication Number:</b> <b>WO 96/10368</b> <b>(43) International Publication Date:</b> 11 April 1996 (11.04.96)
<b>(21) International Application Number:</b> PCT/US95/12587 <b>(22) International Filing Date:</b> 28 September 1995 (28.09.95)  <b>(30) Priority Data:</b> 08/315,927      30 September 1994 (30.09.94)      US  <b>(71) Applicant:</b> NOMOS CORPORATION [US/US]; 2591 Wexford Batne Road, Sewickley, PA 15143 (US).  <b>(72) Inventors:</b> CAROL, Mark; 2591 Wexford Bayne Road, Sewickley, PA 15143 (US). DAY, James, L.; 6999 Willowdale Drive, Cincinnati, OH 45248 (US). MILLER, Erik, G.; 916 S. Aiken Street #3, Pittsburgh, PA 15232 (US).  <b>(74) Agents:</b> EBY, C., Richard et al.; Wood, Herron & Evans, 2700 Carew Tower, Cincinnati, OH 45202 (US).		<b>(81) Designated States:</b> AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).  <b>Published</b> <i>With international search report.</i>  <b>(88) Date of publication of the international search report:</b> 30 May 1996 (30.05.96)

**(54) Title:** APPARATUS AND METHOD FOR NEUROSURGICAL STEREOTACTIC PROCEDURES

**(57) Abstract**

An apparatus and method are disclosed for displaying a path between a selected target and selected points on a patient's skull and for guiding surgical instruments along any selected path. The system (10) is comprised of an image display system (12), an articulated arm and probe (18), and a stereotactic system (16). The sub-systems are coupled to one another so that the articulated probe (18) may be used to select patient fiducial points that correspond to selected image fiducial points. Using these points, the image display system (12) coregisters the external locations to the displayed images so that the probe condition may be displayed with the displayed images. The system (10) further permits the identification of a selected target (T) within a patient's brain and to project a path from the external position to the target prior to the performance of a craniotomy. After evaluation of the path, a surgeon may lock the stereotactic system (16) in place to preserve a selected surgical path and to guide instruments along that path. A method of utilizing the system to perform such surgical procedures is also described.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

## INTERNATIONAL SEARCH REPORT

Internat Application No

PCT/US 95/12587

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61B19/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,5 230 623 (GUTHRIE ET AL.) 27 July 1993 see column 3, line 14 - column 4, line 9 ---	1,17,27, 28
A	WO,A,88 09151 (SCHLÖNDORFF) 1 December 1988 see claim 1 ---	1,17,27, 28
A	EP,A,0 427 358 (ALLEN ET AL.) 15 May 1991 cited in the application see claim 1 ---	1,17,27, 28
A	US,A,5 279 309 (TAYLOR ET AL.) 18 January 1994 see claim 1 --- -/--	1,17,27, 28



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

\*&\* document member of the same patent family

Date of the actual completion of the international search

15 March 1996

Date of mailing of the international search report

25. 03. 96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+ 31-70) 340-3016

Authorized officer

Glas, J

## INTERNATIONAL SEARCH REPORT

Internat Application No  
PCT/US 95/12587

C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 805 615 (CAROL) 21 February 1989 cited in the application see claim 1 -----	1,17,27, 28

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US95/12587

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 13-16  
because they relate to subject matter not required to be searched by this Authority, namely:  
Please see Rule 39.1(iv) PCT.
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

Internal Application No

PCT/US 95/12587

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-5230623	27-07-93	NONE	
WO-A-8809151	01-12-88	CA-B- 1336923	05-09-95
		DE-A- 3717871	22-12-88
		AU-B- 621053	05-03-92
		AU-B- 1805688	21-12-88
		DE-D- 3884800	11-11-93
		EP-A,B 0359773	28-03-90
		US-A- 5186174	16-02-93
		CA-A- 1325850	04-01-94
		US-A- 5494034	27-02-96
EP-A-427358	15-05-91	AU-B- 664863	07-12-95
		AU-B- 2745192	17-12-92
		AU-B- 632633	07-01-93
		AU-B- 6590790	16-05-91
		CA-A- 2029401	09-05-91
		EP-A- 0647428	12-04-95
		JP-A- 3168139	19-07-91
		US-A- 5142930	01-09-92
		US-A- 5230338	27-07-93
US-A-5279309	18-01-94	US-A- 5445166	29-08-95
		US-A- 5402801	04-04-95
US-A-4805615	21-02-89	AU-B- 5948786	08-01-87
		CA-A- 1278969	15-01-91
		EP-A- 0207452	07-01-87
		JP-A- 62038147	19-02-87
		US-A- 4955891	11-09-90